Candidate Name	Centre Number	Candidate Number
		2

GCE AS/A level

1071/01

BIOLOGY/HUMAN BIOLOGY – BY1

A.M. TUESDAY, 12 January 2010

1½ hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**6**	
2	**6**	
3	**11**	
4	**11**	
5	**12**	
6	**14**	
7	**10**	
Total	**70**	

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

Examiner only

1. Two types of nucleic acid, DNA and RNA are found in cells. Statements in the table, may apply to DNA, RNA or both. Complete the table by putting a tick (✓) if the statement is true or a cross (×) if the statement is not true. [6]

	DNA	*RNA*
Contains a pentose sugar		
Found in the nucleus		
Thymine is never present		
Consists of a double helix		
Molecules short lived		
Associated with ribosomes		

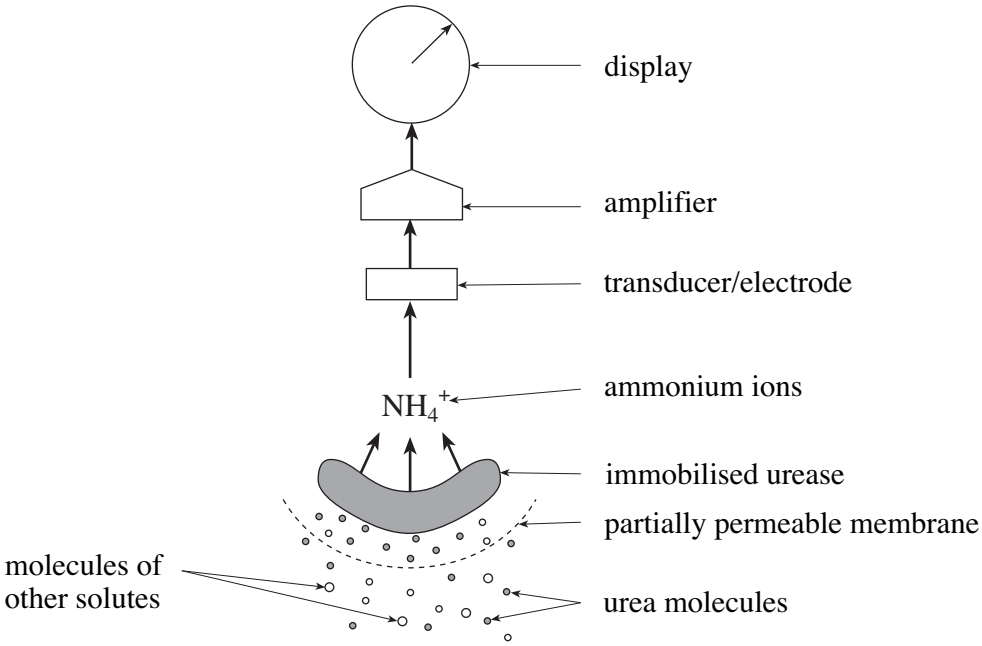
(Total 6 marks)

2. The table below describes structural features and functions of some of the organelles found in eukaryotic cells. Complete the table. [6]

Organelle	*Structural feature*	*Function of **feature***
Nucleus	Nucleolus	
	Inner membrane folded into cristae	
	Vesicle containing hydrolytic enzymes	Cell lysis
Golgi body		

(Total 6 marks)

3. The diagram below shows a biosensor that uses the enzyme urease to measure urea in either the blood or urine.



(a) (i) Name **one** method that could be used to immobilise the urease. [1]

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(ii) State **three** advantages of using immobilised enzymes. [3]

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(b) (i) Describe the function of the partially permeable membrane in this biosensor. [2]

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(ii) With reference to the diagram, describe the role of this transducer. [2]

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Turn over.

(c) If the biosensor was used to test two blood samples, explain why the temperature of the two samples should be the same. [2]

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(d) Name a medical condition which a biosensor can detect. [1]

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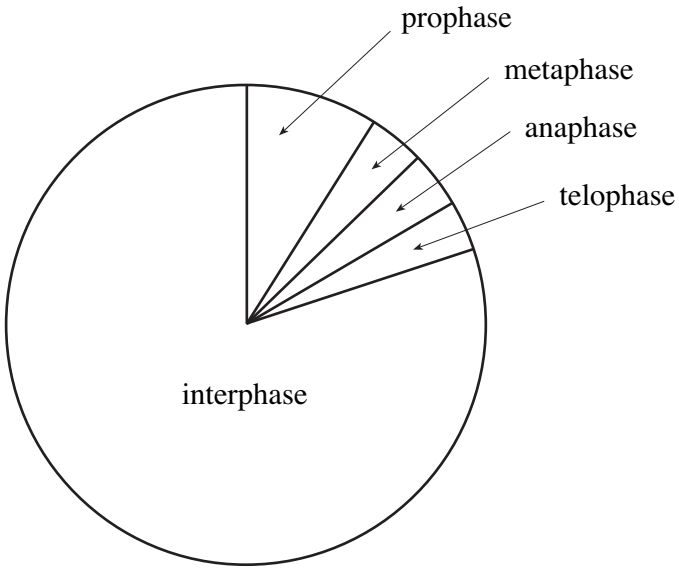
(Total 11 marks)

4. The drawing shows a simplified diagram of the cell cycle. The size of each segment indicates the relative length of each phase.



(a) (i) Draw an arrow on the diagram to show the correct sequence of events in the cycle. [1]

(ii) On the diagram add a segment to show the point at which cell division (cytokinesis) occurs. [1]

(b) List **four** events that occur during interphase. [4]

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(c) Name the stage of mitosis where each of the following occurs.

(i) Chromatids line up at the equator. [1]

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(ii) Centromeres split. [1]

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(iii) Spindle fibres contract and shorten. [1]

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(iv) Chromosomes are first visible as a pair of chromatids. [1]

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(v) Nuclear membrane reforms. [1]

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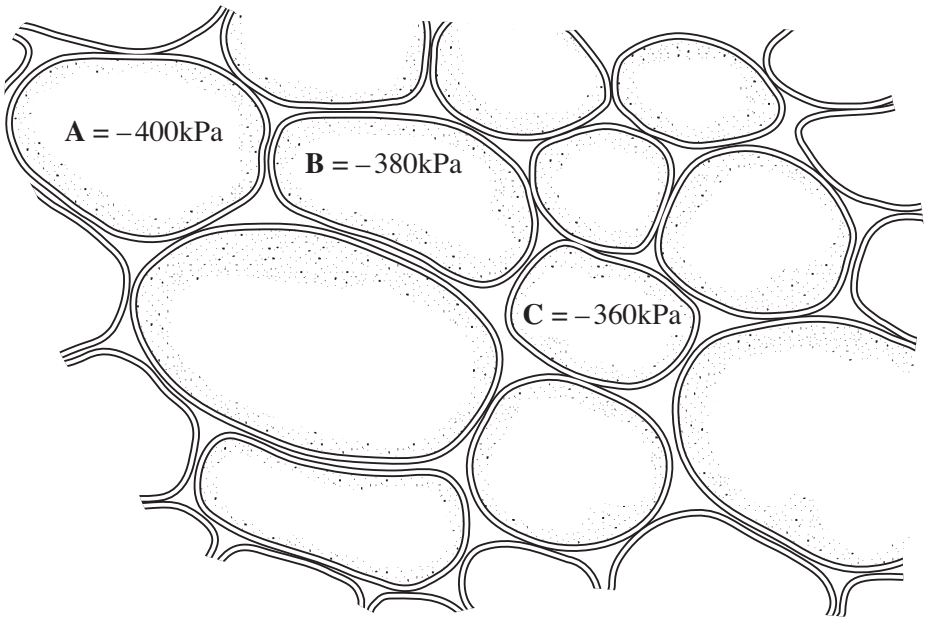
(Total 11 marks)

Examiner only

5. The diagram shows cells taken from the stem of a plant. Cells **A**, **B** and **C** are adjacent cells and the figures give the water potential Ψ of each cell.



(a) (i) Draw arrows on the diagram to show the overall direction of water movement between these **three** cells. [1]

(ii) Explain your answer in terms of water potential. [2]

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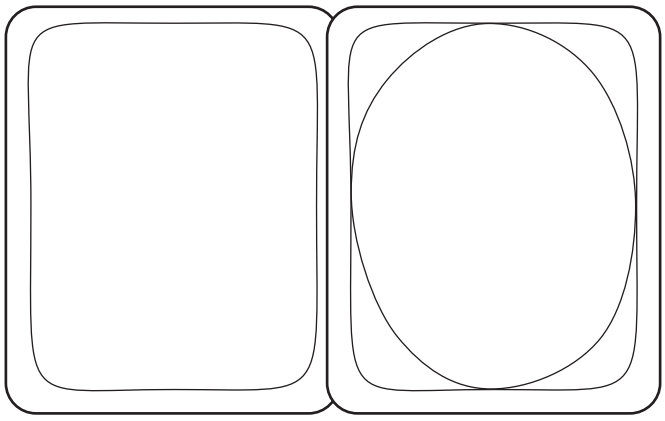
(b) The diagram below shows two plant cells, **X** and **Y** as seen through a microscope. The figures show the solute potential Ψs and the pressure potential Ψp for both cells and the water potential Ψ for cell Y.

Cell **X**

Ψp = 1000kPa

Ψs = –1800kPa



Cell **Y**

Ψp = 0kPa

Ψs = –1000kPa

Ψ = –1000kPa

Water relations in the cells are given by the following equation:

$$\Psi \text{ cell} = \Psi s + \Psi p$$

(i) Calculate the water potential, Ψ, of cell **X**. Show your working. [2]

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(ii) State the name of the condition shown by cell **Y** and explain how this condition could have arisen. [3]

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(c) (i) Cell **X** has the higher pressure potential Ψp. Explain how this pressure potential is built up in cell **X**. [3]

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(ii) Suggest the effect on seedlings if all of their cells were in the condition as shown in cell **Y**. [1]

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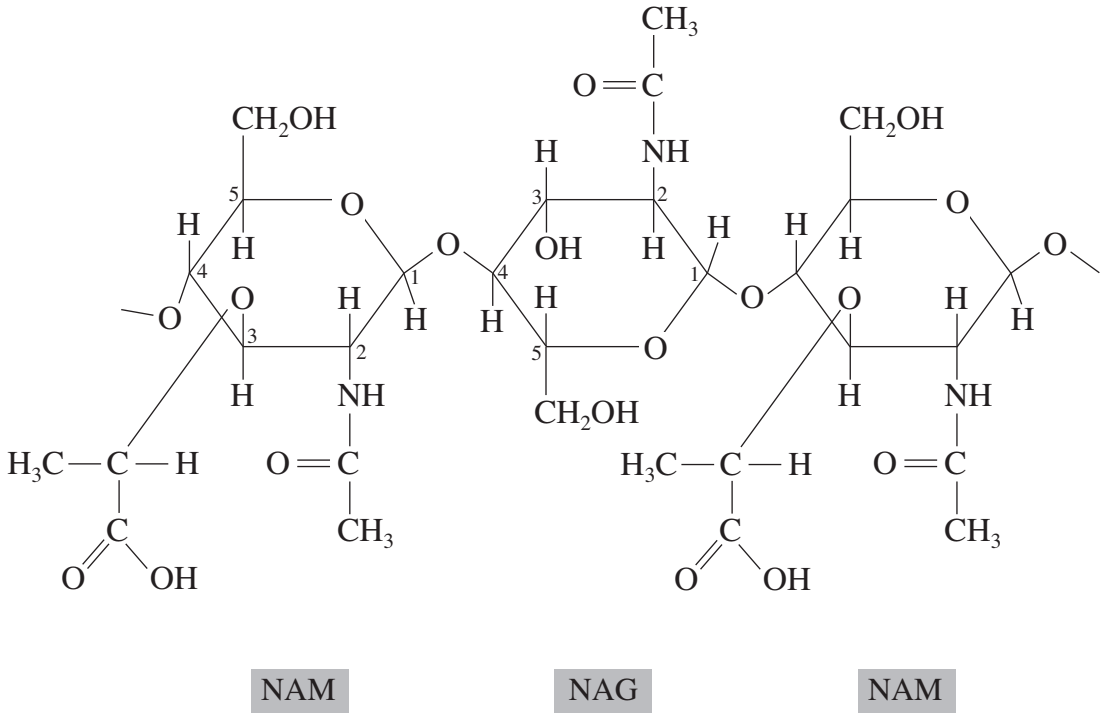
(Total 12 marks)

Examiner only

6. Heteropolysaccharides consist of long chains of monosaccharides. Each monosaccharide is attached to a non-carbohydrate part.
Bacterial cell walls are made from a heteropolysaccharide consisting of two different monosaccharides – abbreviated to NAG and NAM.
The linear polymer is made up of alternating NAG and NAM molecules, linked by glycosidic bonds.
These chains are arranged in the same way as cellulose of plant cell walls.
The glycosidic bonds can be broken by the enzyme lysozyme.



(a) (i) Draw a circle around the part of **one** of the monosaccharide units that is 'non-carbohydrate'. [1]

(ii) On the diagram, draw an arrow labelled **B** to show a bond which could be broken by the enzyme lysozyme. [1]

(iii) Name the type of reaction involved in the breaking of the bond. [1]

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(iv) Explain what is meant by the phrase 'arranged in the same way as the chains in cellulose'. [3]

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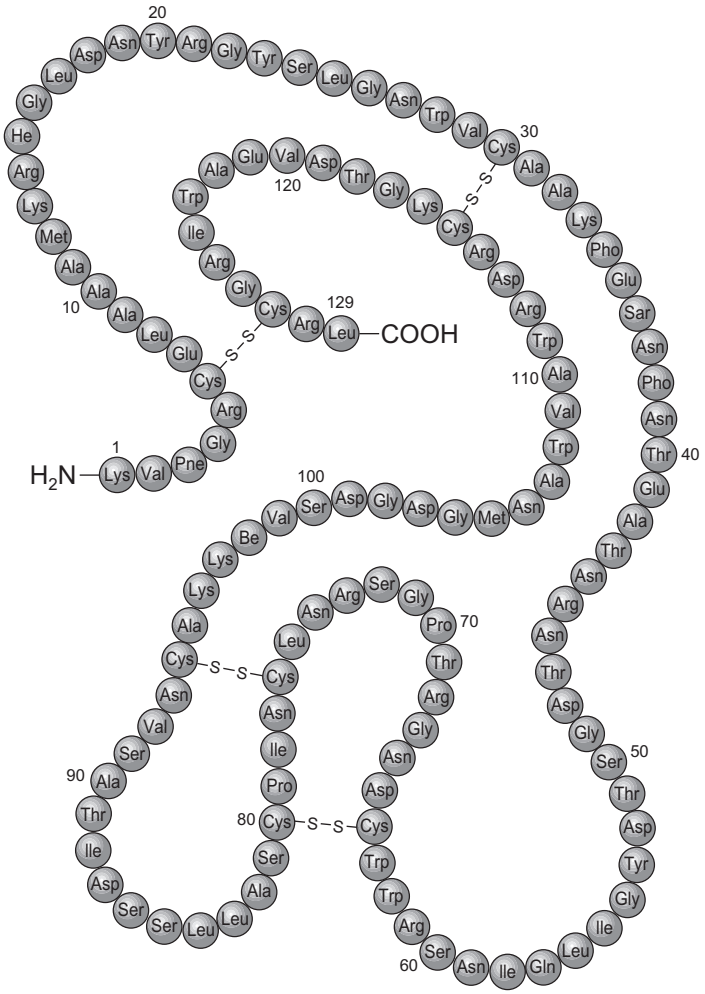
Examiner only

(b) The diagram shows a molecule of the enzyme lysozyme.



(i) State the highest level of protein structure shown in the diagram. [1]

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(ii) Explain the importance of the –S–S– linkages to the functioning of the enzyme. [3]

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Examiner only

(c) Catalase is an enzyme which breaks down hydrogen peroxide into water and oxygen. Hydrogen peroxide is a highly toxic waste product of metabolism.
An investigation was carried out to determine the relative amounts of catalase in samples of potato, liver and apple. The samples were ground to a pulp and added to hydrogen peroxide in measuring cylinders. The table shows the height of the resulting bubbles in the cylinders.

Sample	*Height of bubbles / cm^3*
Potato	4
Liver	9
Apple	1

(i) State **two** variables that should be controlled during this investigation. [2]

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(ii) From the table, liver contains the most catalase. Suggest an explanation for this result. [2]

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(Total 14 marks)

Examiner only

7. Answer **one** of the following questions.
Any diagrams included in your answer must be fully annotated.

Either, *(a)* The cell (plasma) membrane consists of a number of parts.
Describe the structure of the cell membrane and the functions of these parts. [10]

Or *(b)* Describe the structure and functions of lipids in plants and animals. [10]

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(Total 10 marks)